narcc Northern Amateur Relay Council of California, Inc.
p.o. box 60531 Sunnyvale, CA 94088-0531

December 13, 1994

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Office of the Secretary
Federal Communications Commission
Washington, DC 20554

RE: ET Docket No. 94-32

Gentlemen:

Enclosed are an original and 9 copies of comments on the Notice of Proposed Rule Making. These comments are made on behalf of the Northern Amateur Relay Council of California, Inc., a voluntary association of over 250 owners of fixed and mobile relay stations in Northern and Central California.

We appreciate your consideration of our position and concerns on this important matter.

Yours, truly,

Carl Guastaferro

Carl Guastaferro
Director

CCG/cg

enclosures

Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
Allocation of Spectrum Below	)	ET Docket No. 94-32
5 GHz Transferred From	)	
Federal Government Use	)	

COMMENTS OF THE NORTHERN AMATEUR RELAY COUNCIL OF CALIFORNIA, INC.

by

Its Spectrum Director

Carl Guastaferro

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TO: The Commission

Comments

I. INTRODUCTION

1. The Northern Amateur Relay Council of California, Inc. (NARCC) is a voluntary association of over 250 owners of Amateur Radio Service fixed and mobile relay stations in Northern and Central California. NARCC grew out of the original California Amateur Relay Council. It was formed in the early 70's in response to the desires of repeater and remote base operators to mutually coordinate channel assignments.

2. NARCC is recognized as the official coordinator for all repeater sub-bands in our area for frequencies 28 MHz and above. Our Board of Directors hold monthly meetings, we publish a quarterly newsletter, our general membership meets semi-annually and we publish an annual directory of our repeater database. We along with our Southern California counterpart, SCRRBA, are active in the band planning process. Our database and current band plans are on file with the American Radio Relay League, Inc. (ARRL). Our comments presented here concern those segments in the 2.3-2.45 GHz band which are being considered for reallocation. The 4660-4685 MHz band is not currently used by the Amateur Radio Service.

II. BACKGROUND

3. The Amateur Radio Service was founded on a number of basic principles. Included is our ability to provide emergency communications services, our contributions to the advancement of the radio art and our expansion of the existing reservoir within our ranks of trained operators, technicians and electronics experts. As the lower bands become more congested, we focus on the upper ones to accommodate new users and promote experimentation. This is our training ground.

Many of our members are active in the commercial sector, working to develop new modulation techniques to enhance and speed up the flow of information. Amateur radio is more than a hobby. It is a service to the public. The radio bands are in effect a laboratory where ideas and formulas are turned into reality. The 2.3-2.45 GHz band is the site for the next phase of our development efforts.

4. Amateurs pride themselves on the ability to educate new members. Our examinations for licenses and upgrades are conducted entirely from within. Much of the learning is by doing. The use of the airwaves provides a live link for exchange of information. It is a great network which allows input from sources who would otherwise be unaware of the topics of discussion. It is truly in the Public Interest to promote our continued development by not only preserving but expanding our operational spectrum.

III. DISCUSSION

5. Prior to the Omnibus Budget Reconciliation Act, the NTIA study and the recent Notice of Inquiry, we were in the process of re-defining our plans for how best to use the spectrum. currently, we have access to the 2300-2310 and 2390-2450 MHz portions of the band. Not to be overlooked is the fact that the entire 2300-2450 band is allocated to the Amateur Radio Service worldwide by the ITU. We need to maintain a significant allocation to be compatible with the rest of the world. Our use of the two band segments is currently secondary (as are all our allocations above 222 MHz) to the Federal Government. We have successfully coexisted with them for decades. More about our secondary status later.

6. There are 4 current and proposed uses for these band segments:

A. Weak Signal - Amateur Satellite, Moonbounce and terrestrial propagation experiments.

B. Narrow-band Point-to-Point Terrestrial Linking (analog and digital voice channels 50 kHz or less).

C. Wide-band Point-to-Point Terrestrial Linking (analog and digital data using channels greater than 50 kHz).

D. Point-to-Point Television (ATV).

Uses B and C require paired frequencies using the lower and upper band segments. If one of the bands is taken away, it effectively precludes the entire band from these types of use.

7. Band sharing - can it be done among those interested in operating in this band? Primary user versus secondary user - who should be who? Should any services be excluded completely? The time has come to formally request the FCC to grant the Amateur Radio Service a primary allocation in this band. Of the 4 uses we have defined, point-to-point linking (B and C) would provide the greatest benefit to the largest number of users. Therefore a suggestion would be to grant the Amateur Radio Service primary status in the 2300-2310 and 2390-2400 MHz segments. Also, amateurs should be granted primary status in the 2400-2402 MHz band for the very important amateur satellite activities.

8. In the remaining portions of the band, we would be secondary users as we are now. There is very little risk in allowing amateurs to share with others. The reason is that we are a highly visible entity. Call signs are given every 10 minutes even by unattended repeater stations. Our prime directive is to provide communications without causing harmful interference.

9. The 2310-2390 portion of the band was removed from the Amateur Radio Service to be reassigned to airborne flight test telemetry use. It is our understanding that there has been no deployment of hardware and that a portion of the band has been reassigned (2310-2360 MHz). Although officially not part of this proceeding, we would like the FCC to consider returning the remaining portion (2360-2390) for amateur use on a secondary basis with other users.

10 Adjacent Channel and Adjacent Band Concerns. Having been employed in the microwave radio business for over 30 years, this commenter is aware of the factors which determine how well communications systems perform. Sensitivity and selectivity are very important but so is dynamic range, the ability of receivers to operate close to specifications over a wide range of input signal levels. To place systems too close to one another in the frequency domain is extremely harmful. It is very likely that this condition will occur when a band is shared by different user groups with totally different equipment types. Therefore, when the Commission considers a sharing of spectrum, the users devices must not only not interfere with one another but must not be subjected to performance degradation due to the presence of other signals. This also applies to equipment in adjacent bands.

11. An example. Recently, the 1850-1990 and 2110-2200 MHz bands were reallocated to make room for PCS, an emerging technology. Originally, there was a 20 MHz guard band set aside to protect Part 74 Auxiliary Broadcast ENG receive facilities operating in the 1990-2110 MHz band. The PCS bands were 1850-1970 and 2130-2200 MHz The ENG receive stations utilize high-gain remotely controlled antennas on mountain tops, tall towers or high buildings. Low-noise pre-amplifiers are built right into the antenna feed systems for maximum performance. A bandpass filter ahead of the LNA prevented overload from signals in the 2 adjacent bands. All seemed well until a PCS manufacturer expressed concern over having to build a high-performance radio that had to operate in 2 non-adjacent band segments. The allocation for PCS was then changed, removing the lower 20 MHz guard band. At the same time, the maximum PCS ERP limit was raised from 150 watts to 1500 watts!

12. What does all this mean? If a PCS base station happened to be co-located with an ENG receive station, no amount of shielding or filtering would prevent the antenna-mounted LNA from overloading. A West Coast consulting engineering firm presented supporting data to the FCC. We understand the reallocation decision is now being reviewed.

13. The Commission by this NPR and Report and Order will attempt to allocate spectrum and combine user groups so the maximum benefit and best use of our limited spectrum will be realized. Disruption of new and existing services must be kept to a minimum. We ask that the Commission

keep in mind the important weak signal work the Amateur Radio community does in this spectrum. Our extremely sensitive receive equipment must be protected from overload by strong local signals which might be several megahertz away in an adjacent band segment. The same holds true for the low power Part 15 devices. They need to be protected from overload.

14. The FCC is faced with a difficult decision on how best to allocate spectrum. The decision will be based on what is in the Public Interest, what will not result in major disruption of service to existing users and what is deemed to be the best use of the spectrum. A secondary issue is the financial benefit from the auctioning of frequencies. Although important, it must be weighed against all the other factors involved. There will be keen competition among the commercial interests. They are looking for spectrum and based on their comments already submitted, don't fully realize the impact on those existing users who may have to give up frequencies. We ask that the Commission consider all factors and decide accordingly.

IV. THE NOTICE OF INQUIRY: AN ANALYSIS OF COMMENTS

15. **Comments to the Notice of Inquiry from Federal Agencies:** Federal agencies generally supported the proposed reallocation proposal. It is important to note that no Federal Agency reported doing an in-depth evaluation of interference dangers, disruption of service to existing users or in any way tried to identify existing or future use of the bands by the currently authorized non-government users. Basically, they all agreed with each other.

16. **Comments made by Amateur Radio Groups:** Commenters also all seemed in agreement with each other. However, we were critical of the NTIA report because it did not seek out input from the private sector. In other words, who was using the bands, how many users and systems were out there and what would be the financial and operational impact to them. It might be said the Amateur Community is to blame because we publish only repeater listings. Point-to-point voice and control links (number and location) is information which we tend to keep private. Also, discussions of future plans are kept to ourselves until we can implement them. Thus, the NTIA may have simply looked at the ARRL Repeater Directory noted the few number of listings in the 2.3 GHz band and concluded there was little or no activity there, with a few exceptions in major cities. However, starting at page 61 of the current directory is a listing of nearly 100 frequency coordinators. Had the NTIA contacted some of them, their conclusion the bands were "sparsely used" would not have been made. Then, having come to the logical conclusion excessive disruption of our services would take place by adding new users, they could have then attempted to carry out the second part of their mandated task: to identify replacement spectrum.

17. At NARCC, we are compiling a list of users and links in the upper bands. It is not intended to be a widely distributed document. The general amateur population does not need to have access to the data. But those involved in band planning and trying to determine how heavily a portion of the spectrum is used, need to have it.

18. Any mention of the number of links and systems in our area would not give the entire picture. The entire US figures would need to be furnished. Please accept our estimate that the number in the 2.3 GHz band is in the hundreds nation-wide. Future expansion will come from the lower bands as they become more congested.

19. Finally, to reiterate our original comment to the NOI, the NTIA did a good job in determining the lowest financial impact to the Government in choosing which bands would be vacated. However, they did not assess the overall financial impact on all users by their selections. For example, a portion of the 1710-1850 MHz Government band, although perhaps more costly up front to vacate, may have had a lesser overall financial impact. Much of the equipment the Government uses in that band is old (FDM multiplex microwave) and represents obsolete technology. It should be targeted for replacement and conversion to digital anyway so why not move it to another band?

20. **Comments made by Part 15 Equipment Manufacturers and Users:** The companies who responded were concerned about the impact of high power commercial equipment on their low power devices. There has been significant migration up to 2402-2417 from the 902-928 MHz band. This was encouraged by the FCC. Their development would be greatly hindered by the interference caused by the higher power transmitters. Part 15 users would not be capable of resolving interference problems. All they would know was that their device did not work properly. They would return it to the manufacturer. After hundreds of devices came back, the manufacturers might do some investigation and much later the source of interference might be uncovered. In summary, coexistence of new commercial services with Part 15 devices is unlikely and the good work already done to encourage development of spread spectrum technology would be slowed if they were not able to expand to the 2400 MHz band.

21. **Comments by other interested parties:** Many of these commenters expressed concern over the needs of private radio users and satellite service providers if the 2.4 GHz band becomes populated with new commercial users. Most felt that their needs would be best met with blocks wider than 10 MHz and blocks above 3 GHz would be of great use. Their needs are the same as ours: we need more spectrum, not less.

22. **Comments made by the FCC.** An analysis of comments (similar to ours) was made by the Commission and presented to Ronald Brown, the Secretary of the US Department of Commerce. Dated August 9th of this year, it recommended that the NTIA continue its investigation and modify some of its findings when it issues a final report. Unless we've missed it, there has been no final report issued. Our interpretation of the FCC's report is that they have acknowledged many of the points raised by the commenters and that a revised reallocation plan was forthcoming. However, the NPR (as we interpret it) makes no actual changes to the original NTIA recommendations. We are confused! However, the language and suggestions made by the FCC in the NPR document does indicate that alternative proposals will be most welcome. We sincerely hope so. One of the FCC's comments was that of a primary allocation for Amateur Radio Service

in parts of the 2.3-2.45 GHz band could be adopted as part of this proceeding. To satisfy our need for spectrum to grow in, it is hoped that a secondary allocation be maintained in at least the same amount of spectrum. As an ideal case, we would like to get back part of the 2310-2390 portion that was lost many years ago. We believe the 2360-2390 band segment could be shared with our service as the secondary user.

V. SPECIFIC COMMENTS ON TOPICS MENTIONED IN THE NOTICE OF PROPOSED RULE MAKING

23. Comment on Paragraph 9. **A general allocation of Fixed and Mobile for the proposed band segments rather than specifying particular uses.** We have no objection to this as long as the Amateur Radio Service is included in the allocation. Not to be ignored is the consideration that different services may operate at very different power levels and operating conditions may be very different at different times and in different portions of the bands. As stated earlier, some devices may be harmed by the presence of strong local signals in a nearby channel. We ask that the Commission place certain limitations to insure all co-users have a reasonable chance of operating successfully.

24. Comment on Paragraph 10. **Channelization, modulation techniques and interference levels.** Although primarily aimed at new users, the guidelines will apply to all those who share the bands. The standards and levels decided upon by this action must be flexible. A system should be in place whereby if after the new users occupy the bands in significant numbers, changes to the standards appear necessary to prevent chaos or serious disruption of services. Something simpler, less time consuming (and less costly) that another NPR.

25. Transmitter power output - most equipment available to amateurs in the 2 GHz band operates in the 1 watt to 10 watt region. For Point-to-Point Linking, that power fed into medium sized parabolic antennas (6-10 feet) will result in reliable communication over distances of 30-60 miles. Energy is confined to a beamwidth of 3 to 5 degrees. Maximum ERP assuming 1-2 dB line losses is about 28-42 dBW. For shorter paths, the power output can be reduced. FCC Rules Part 74.641 details a workable power reduction used in the nearby Auxiliary Broadcast Band.

26. Receiver Sensitivity - Threshold of equipment available to amateurs is of course dependent on the channelization and RF/IF bandwidth used. However, receiver noise figures are likely to be in the 2 dB to 8 dB region, depending on whether a pre-amp was used.

27. Receiver Overload - A worst-case scenario would occur if the receiver used a preamp and if an interfering signal in the RF bandwidth caused the LNA to go into a compression mode. Typically, in 2 GHz equipment, that would occur when the pre-amp's output level was about 0 dBM or 1 milliwatt. Most preamps have 20 dB gain so working backwards:

Maximum input to pre-amp - -20 dBM.
Maximum antenna input power - -54 dBM.

This assumes a 10 foot dish, no line losses and the interfering signal coming into the dish on its main lobe. converting to dBW, we add 30 and come up with -84 dBW. Assuming the receiver LNA does not overload, there still could be a problem if an interfering signal falls within the IF passband of the receiver and is less than 30 dB below the desired signal. Using digital modulation, a much stronger interferor could be tolerated, perhaps equally as strong as the desired carrier.

28. Comment on Paragraphs 11, 12 and 13. **Specific communications services rather than a general allocation.** While we agree there is a danger to allowing all different forms of services to be shared with existing users, it may be possible to select sharing partners who can co-exist with one another. For example, we received a letter from the In-Flight Phone Corporation soliciting our support for their proposed use of the band. Their ground-to-air plan may offer a reasonable chance for successful co-existence with the Amateur Radio Service. On the other hand, Southwestern Bell's proposed use of the 2300-2310 and 2390-2400 MHz for wireless local loop service is in direct conflict with our plans for a primary allocation there.

29. Comment on Paragraph 14. **Unlicensed PCS and MDS in this band.** We do not favor allowing unlicensed PCS in the band. Since the FCC moved licensed PCS to the 1850-1990 MHz band, the 2130-2150 segment would appear a logical choice for them. Band sharing by these services with higher powered radios may prove quite troublesome. It would create a similar situation to operators of Part 15 devices in the 2402-2417 MHz band segment.

30. Comment on Paragraph 16. **The FCC's comments to other suggestions for use of the 2390-2400 band segment.** We agree wholeheartedly with the FCC. Most of the parties supporting alternative uses of the spectrum did not address the compatibility issue of their sharing with, among others, the Amateur Radio Service. Nor did they provide a cost/benefit analysis in support of their request.

31. Comment on Paragraph 17. **Possible inclusion of the 2300-2310 MHz band segment in this Report and Order.** As stated previously, we are proposing the pairing of this band with the 2390-2400 segment for Point-to-Point Linking. The time has come to grant the Amateur Radio Service a primary allocation. These 2 segments represent a logical choice. We feel, linking for voice, data and control of other facilities represents a major portion of our activity at present and will be more so in the future. By moving many of our UHF links into this band, it will free up valuable spectrum in the lower band for increased mobile use. We therefore strongly support the FCC's thinking to include the 2300-2310 band segment in the forthcoming Report and Order.

32. Comment on Paragraph 18. **Continued use of the 2402-2417 portion of the band by Part 15 Users.** It would appear to be a challenge for unlicensed low power devices to operate in harmony with commercial interests. We agree that their uses are consistent with how the FCC would like to see the band utilized. However, due to the very real chance there will be conflicts and interference with new services, it is not likely Part 15 devices can co-exist with new commercial services. Part 18 ISM interference will continue to be a nagging problem. Commercial interests have overcome this by brute force techniques, i.e. higher power, filtering and

directional antennas. These methods are not available to Part 15 device users. Perhaps a portion of the 2130-2200 band originally targeted for PCS could be used by Part 15 devices.

33. Comment on Paragraph 20. **Disruption of Amateur Radio Service in the 2390-2400 and 2402-2417 MHz Bands.** This is the key issue for us. We reiterate our earlier comment that the NTIA failed to meet the criteria of the Reconciliation Act. Many opportunities were made available to the NTIA to determine amateur usage in the 2.3 GHz bands. The ARRL Repeater Directory clearly states it is a reference for itinerant users. It does not claim to be a complete database for all activity above 30 MHz. There are nearly 100 listings for frequency coordinators in the directory. Names and phone numbers. These knowledgeable people do have complete listings of all auxiliary voice, data and control links in their area. We do not believe the NTIA attempted to contact any of our coordinators. Had they done so, they would have determined the proposed additional use of this spectrum would cause excessive disruption of the services we perform in the band.

34. It appears that for reasons stated by most amateur groups and several others commenting to the NOI, the Commission has agreed to take into account how new commercial service would impact our presence in these bands. Although not ruling out removing certain segments from amateur service, the FCC in its NPR agrees that disruption of our operations is a matter they will consider. Coupled with that is the allocation of replacement spectrum for the Amateur Radio Service, mandated by the Omnibus Budget Reconciliation Act. Because the NTIA failed to carry out the directives, any recommendations they may have come up with are seriously flawed.

35. Once again, here are several services we perform in these bands that truly serve the Public Interest and that no commercial entity can offer

1 - Our ability to provide emergency communications during periods when commercial channels are cut off.

2 - Our work with weak signals, satellite communications, moonbounce and terrestrial propagation experiments.

3 - Development of more robust modulation techniques through actual field testing over lengthy periods. Commercial interests do not have the luxury of lots of time. We draw from a vast pool of electrical, microwave and RF engineers, have regular meetings and thanks to our communications networks we can discuss and exchange information. Because communication by our networks (repeaters, voice networks and packet) are free, there tends to be a more relaxed and more thorough exchange. No clock ticking in the background.

4 - Point-to-Point Television (ATV) is expanding into the 2.3 GHz band. Here in Northern California, we have over 25 systems already coordinated. Although most are in the UHF and 1.2 GHz band, our plans call for a gradual migration to 2.3 GHz. We anticipate an adoption of a compressed MPEG type format when it becomes affordable. Digital modulation tends to be more immune to interference. Thus we feel there will be less ISM interference problems with the newer technologies. In the meantime, ATV needs room to expand with a great deal of interest coming from our technician licensees. They now make up a majority of the US amateur population. In addition to maintaining spectrum in the 2417-2450 MHz band segment, we may

request that the FCC consider making room for an additional TV channel assignment in the 2390-2396 MHz band and adding a channel in the 420-440 MHz UHF band. That is still in the discussion stages and we will submit a formal request when our research is done sometime in 1995.

VI. SUMMARY AND RECOMMENDATIONS

35. **To summarize, NARCC is asking the Commission as part of its Report and Order to grant the Amateur Radio Service a primary allocation in the band 2300-2310 MHz paired with 2390-2400 MHz. We wish to maintain secondary status in the remaining portions we are currently authorized to use.** In addition, in view of the very light utilization of the 2360-2390 band, we request the FCC allow amateur radio to operate there as a secondary user.

36. With limited spectrum available, sharing of certain portions is a necessity. We will work with those services in common bands and never knowingly cause harmful interference. As newer and more efficient modulation and signal recovery techniques become available (and affordable) to the Amateur Community, we will try to implement them to further enhance the communications process.

Respectfully submitted,

Carl Guastaferro
Spectrum Director
Northern Amateur Relay Council of California Inc.